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United States
Environmental Protection
Agency

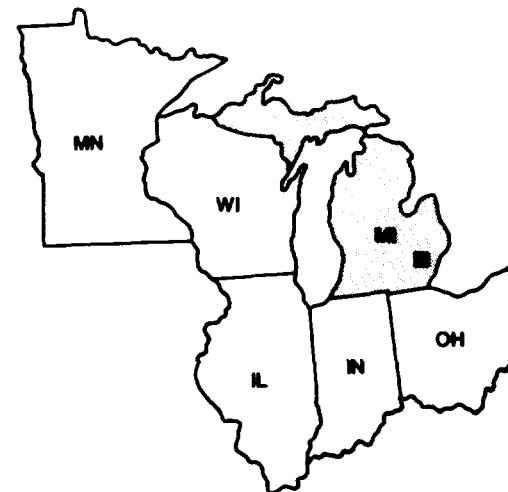
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TS-PIC-91028
July 1991

Research and Development

EPA Site Analysis
Hi Mill Manufacturing Co.
Highland, Michigan

EPA Region 5
and OERR



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Site Analysis
Hi Mill Manufacturing Co.
Highland, Michigan

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NOTICE

This document has undergone a technical and quality control/assurance review and approval by personnel of the EPA/ORD Environmental Monitoring Systems Laboratory at Las Vegas (EMSL-LV), and is for internal Agency use and distribution only.

ABSTRACT

This report presents an analysis of aerial photography of the Hi Mill Manufacturing Company, located northeast of Highland, Michigan. The site was analyzed to assist the Environmental Protection Agency's (EPA) Region 5 in its remedial investigation of the site.

As a manufacturer of tubular aluminum, copper, and brass parts, the Hi Mill Manufacturing Company disposed of used rinse water into at least one unlined lagoon onsite. Rinse water was also sprayed into the air as a disposal method. In 1982, heavy metals were detected in marsh sediments and water in the area surrounding the site.

Features found during the analysis of the Hi Mill Manufacturing Company include three separate lagoons, possible pipelines, mounds and channelized drainage that appeared after the lagoons had been filled, plumes which may be related to waste water disposal, possible refuse, and light-toned piled material.

Hydric soils information from the county Soil Survey and wetlands delineated on the National Wetlands Inventory map have been annotated for the area within a 1-kilometer (0.6-mile) radius of the site.

The EPA's Environmental Photographic Interpretation Center in Warrenton, Virginia, a branch of the Advanced Monitoring Systems Division of the Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, performed this analysis at the request of the Superfund Support Section of EPA Region 5 in Chicago, Illinois, and the Office of Emergency and Remedial Response in Washington, D.C. This analysis covers the period between 1957 and 1991, and the report was completed in July 1991.

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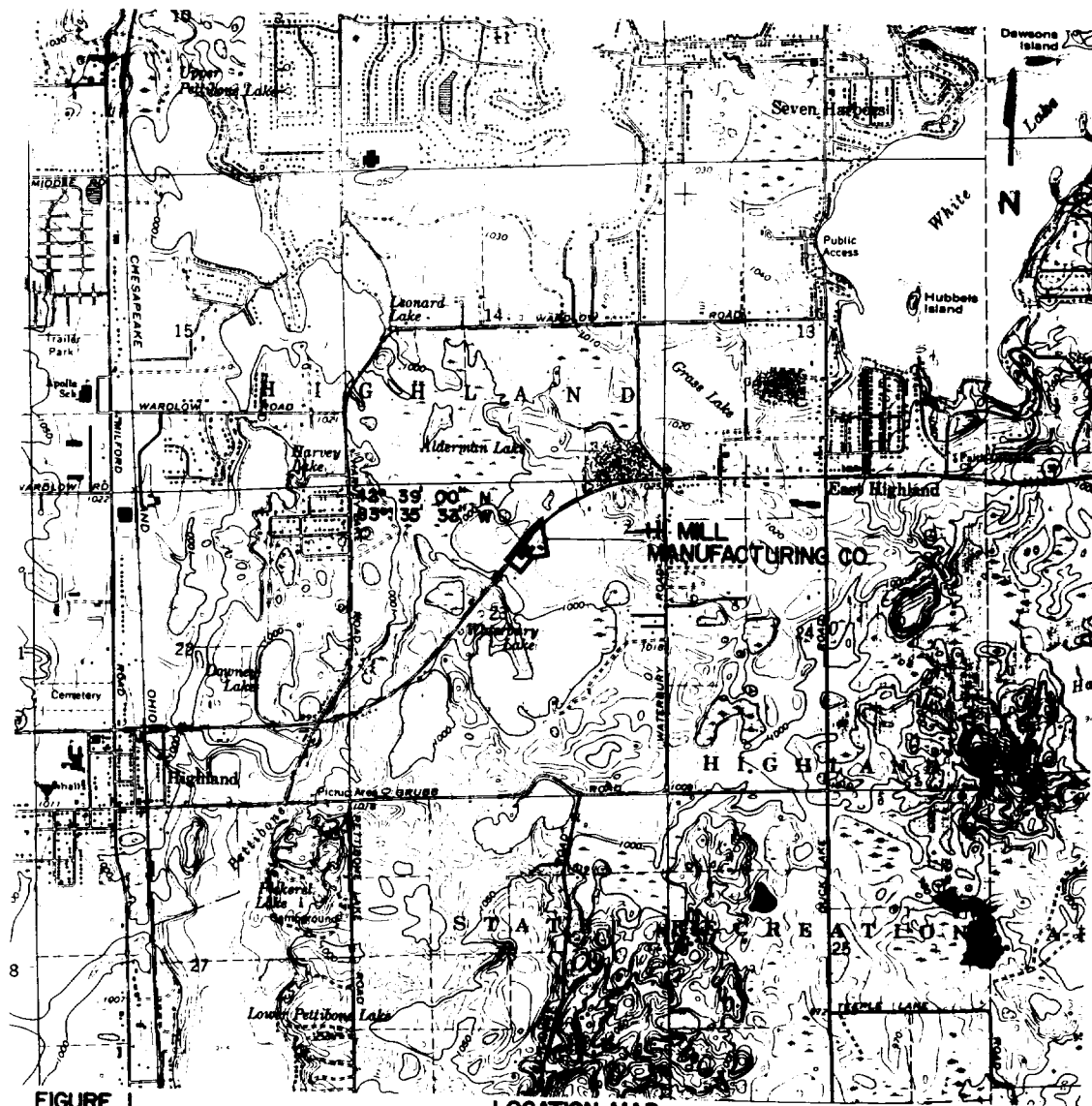


FIGURE 1
HI MILL MANUFACTURING CO.

LOCATION MAP
HIGHLAND, MI. QUAD

APPROX. SCALE 1:24,000

INTRODUCTION

An analysis of aerial photography was performed on the Hi Mill Manufacturing Company, located approximately 2.4 kilometers (1.5 miles) northeast of Highland, Michigan. The site comprises 2.4 hectares (6 acres). The U.S. Environmental Protection Agency's (EPA) Region 5 requested this analysis in support of its remedial investigation of the site, where waste water was reportedly disposed in adjacent wetlands.

Figure 1 shows the site location, keyed to a photocopy of a U.S. Geological Survey (USGS) 1:24,000-scale topographic map. Site boundaries used in this analysis were determined from observations made from the aerial photography in conjunction with collateral data supplied by EPA Region 5 and do not necessarily denote legal property lines or ownership.

Aerial photography of the Hi Mill Manufacturing Company was obtained to represent the period from 1957 to 1991.¹ Black and white photography from 1957, 1964, 1967, 1970, 1973, 1975, 1976, 1980, and 1988; color infrared photography from 1978; and color photography from 1991 were used for this analysis. Photography from 1964, 1970, 1973, and 1976 was analyzed but not reproduced for this report due to a lack of significant change of features at the site.

Since 1946, the Hi Mill Manufacturing Company has fabricated tubular aluminum, copper, and brass parts. Collateral information supplied by EPA Region 5 states that prior to 1981, rinse water from dipping operations was discharged into an unlined lagoon onsite or sprayed into the air. The Hi Mill Manufacturing Company is situated adjacent to the Highland State Recreation Area and in 1982, heavy metals were found to be contaminating marsh sediments and water within the recreation area. An estimated 13,600 people obtain drinking water from private wells within 4.8 kilometers (3 miles) of the site.²

¹A complete listing of photography, maps, and publications used in this report is provided in the References section.

²From collateral information supplied by EPA Region 5.

Analysis of the Hi Mill Manufacturing Company yielded evidence of three separate lagoons, possible pipelines, mounds and channelized drainage which appeared after the lagoons onsite were filled, plumes which may be related to the disposal of rinse water, possible refuse, and light-toned piled material.

Figure 2 shows the location of hydric soils from the county Soil Survey and National Wetlands Inventory map delineations for the area within a 1-kilometer (0.6-mile) radius of the site.

The EPA's Environmental Photographic Interpretation Center in Warrenton, Virginia, a branch of the Advanced Monitoring Systems Division of the Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, performed this analysis at the request of the Superfund Support Section of EPA Region 5 in Chicago, Illinois, and the Office of Emergency and Remedial Response in Washington, D.C. This analysis covers the period from 1957 to 1991, and the report was completed in July 1991.

Throughout this report, collateral information will be designated by an asterisk (*).



FIGURE 2
HI MILL MANUFACTURING CO.

HYDRIC SOILS / NWI WETLANDS
AUGUST '17, 1978

APPROX. SCALE 1 10,000

METHODOLOGY

A search of government and commercial sources was undertaken to obtain the best available aerial photography of the site spanning the desired time frame. The photography and other sources of information used in this report are listed in the References section.

The analysis was performed by viewing backlit transparencies of aerial photography through stereoscopes. Stereoscopic viewing creates a perceived three-dimensional effect which, when combined with viewing at various magnifications, enables the analyst to identify signatures associated with different features and environmental conditions. The term "signature" refers to a combination of visible characteristics (such as color, tone, shadow, texture, size, shape, pattern, and association) which permit a specific object or condition to be recognized on aerial photography.

Photographic prints were made from those years of aerial photographic coverage that reveal significant information about the site. The analyst's findings are annotated on overlays to prints and/or base maps and described in the accompanying text. Site boundaries or areas used in this analysis were determined from the aerial photography in conjunction with collateral data supplied by EPA Region 5 and do not necessarily denote legal property lines or ownership.

Due to factors inherent in the photographic printing process, prints do not exhibit the level of detail that is visible in the original aerial photography. Therefore, some features identified from the aerial photography may not be clearly discernible, or even visible, on the photographic prints presented in this report.

Color infrared film has been reproduced for the 1978 photography (Figures 2 and 5). Normal color film records reflected energy in the blue, green and red portions of the electromagnetic spectrum. Color infrared film differs in that it is sensitive not only to reflected blue, green and red energy, but also to reflected energy in the infrared portions of the electromagnetic spectrum; however, the blue energy is filtered

out and only the green, red, and infrared energy is recorded. When color infrared film is processed, it displays "false" colors that do not correspond with the true colors of the features photographed. For example, features that are highly reflective in the infrared portion of the spectrum, such as healthy green vegetation, appear red to magenta on color infrared film. The false color displayed by a feature is produced in accordance with the proportions of infrared, green, and red energy it reflects. These proportions are referred to as the feature's "spectral reflectance characteristics." To interpret the true color of a particular feature accurately from color infrared film, a knowledge of the spectral reflectance characteristics of that feature is required. This information is not readily available for the majority of features identified in this report. Therefore, unless otherwise indicated, no attempt is made to interpret the true colors of features identified on the color infrared film analyzed for this report.

Wetland symbols are included on Figure 2 of this analysis in an effort to denote wetlands within a 1-kilometer (0.6-mile) radius of the site. Placement of symbols is based on the presence of soil series that are listed as hydric by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS) publication Hydric Soils of the United States, and/or by the use of the National Wetland Inventory (NWI) map of the area published by the U.S. Fish and Wildlife Service (FWS). The USDA SCS definition of hydric soil is as follows: "A hydric soil is a soil that is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part."

The terms "possible" and "probable" are used to indicate the degree of certainty of signature identification. "Possible" is used when only a few characteristics are discernible or these characteristics are not unique to a signature. "Probable" is used when incrementally more characteristics are discernible. No qualifying terms are used when the characteristics of a signature allow for a definite feature identification.

AERIAL PHOTO SITE ANALYSIS

JUNE 5, 1957 (FIGURE 3)

Figure 3 represents the first available photographic coverage of the Hi Mill Manufacturing Company. Two buildings (B1 and B2) are present, and a considerable amount of disturbed ground (DG) is visible northeast of the buildings. This may be related to future construction onsite. A small pond at the southeast corner of the site does not appear related to site activity at this time. The extent of the pond cannot be determined because of the heavy tree canopy.

A drainage analysis was performed for this year, with any significant changes noted on subsequent years of photography. Target Pond* is located directly east of the Hi Mill Manufacturing Company. Three streams enter Target Pond: two from the north and one from the west. Target Pond drains south into Waterbury Lake. Streams west of the site flow south and southeast towards Waterbury Lake.



FIGURE 3
MILL MANUFACTURING CO.

JUNE 5, 1967

APPROX. SCALE 1:2,800

APRIL 4, 1967 (FIGURE 4)

Photography from 1964 was not reproduced for this report due to a lack of significant change of features during that year.

B1 undergoes many changes during the course of this analysis. Whether additions have been built onto the original structure seen in 1957, or if an entirely new building has been constructed, cannot be determined. The structure will continue to be annotated as B1. B2 remains and a parking lot (not annotated) northeast of the buildings exists where disturbed ground was evident on the 1957 photography. Much of the northeastern section of the site has been deforested.

A fence blocks access into the site from Route 59. Fencing is not visible around the south or east sides of the site.

A lagoon (L1) is seen onsite for the first time during this year of analysis, and contains liquid (not annotated). A linear ground scar (GS) and a ditch lead towards the northern corner of the lagoon. Leaf-off conditions now permit full visibility of the pond southeast of the lagoon. The northern extent of the pond is adjacent to the lagoon, but the two do not appear to be joined. However, the shape of the northern half of the pond, plus the presence of disturbed ground between the lagoon and the pond, indicates the possibility that some connection between the two may exist. It should also be noted that the tone (not annotated) of the liquid within the northern half of the pond differs from that of the southern half. A difference in tone is not visible on any other year of photography analyzed.

Possible refuse (R), light-toned and coarse-textured, is piled west of the lagoon. A ditch lies south of the possible refuse. This ditch extends from B1 and turns north towards the lagoon but does not appear to connect to the lagoon. A pool of liquid (LQ) is present south of the ditch.

Piles of dark-toned (DK) material (M) are visible southwest of B1.



FIGURE 4
MILL MANUFACTURING CO

APRIL 4, 1967

APPROX SCALE 2,500

MAY 10, 1975 (FIGURE 5)

Photography from 1970 and 1973 was analyzed but not reproduced for this report because of a lack of significant change of features onsite. Any significant findings will be discussed during this year of analysis.

Between 1967 and 1970, a third building, B3, was constructed on the northeast side of L1. B1 and B3 do not undergo any major changes throughout the remainder of the analysis. Therefore, they will be annotated but no longer discussed except in relation to other features onsite. B2 was removed between 1967 and 1970.

Fencing along the Route 59 entrance to the site no longer exists. A fenced area northwest of B3 is present. Possible refuse, medium-toned and coarse-textured, is visible outside the fence, north of B3.

L1 again contains liquid and the southwest and southeast sides (not annotated) appear to have been straightened or walled. In 1970, three possible excavations (not annotated) were visible southwest of the lagoon, next to a probable pool of liquid. Both are no longer visible. Also seen in 1970, adjacent to the excavations, was a possible pipe (P) which appeared to originate from B1 and lead towards L1. The possible pipe is no longer visible. The ditch and ground scar, seen in 1967 northeast of L1, are no longer present due to the construction of B3. Two possible pipes are visible on the northwest side of L1. Another possible pipe was seen at L1 in 1970 but cannot be detected on this year of photography. As in previous years, the pond south of L1 does not appear to connect to L1. A light-toned (LT) material is now seen along the west edge of the southern half of the pond.

The long ditch and the pooled liquid, seen in 1967 south of B1, are no longer present. A ground scar, seen on the 1970 photography in the former location of the ditch, has now revegetated. Possible refuse, seen in 1967, is no longer present; its former location is covered by additions to B1.

A group of possible containers (C) is noted within the fence southwest of B1. The piled dark-toned material seen in this portion of the site in 1967 is no longer present. Fencing now exists south and east of B1.



FIGURE 5
MILL MANUFACTURING CO.

MAY 10, 1975

APPROX. SCALE 1:2,900

AUGUST 17, 1978 (FIGURE 6)

Due to a lack of change in features, the 1976 photography was not reproduced for this report. Any significant findings from that year will be discussed during this year of analysis.

An area of disturbed ground, which extends to Target Pond, is now seen in the north portion of the site, outside the site's fence. The presence of this area may be related to water supply lines which reportedly extend northwest from B1 through the parking lot towards Target Pond.*

Fencing has been altered, and now forms a triangular shape around the site. Possible refuse, seen in 1975 adjacent to B3, is no longer present.

A second lagoon (L2) now exists south of L1, and contains liquid. Ground scars (not annotated) were seen in 1976 in the current location of L2. L1 and L2 do not appear to be joined. L1 also contains liquid, and three possible pipes are seen along its northwest side. The walled sides of L1, seen in 1975, are no longer apparent but were seen in 1976.

An access road, within the fence, now exists around the southeast perimeter of the site. The construction of this road appears to have eliminated most of the small pond (no longer annotated).

Possible refuse is noted southwest of B1 where possible containers were seen in 1975.



01
MAY 1978

AUGUST 17, 1978

APPROX 1000

APRIL 18, 1980 (FIGURE 7)

The disturbed ground, seen in 1978 leading to Target Pond, has been paved over. A plume, visible within Target Pond, appears to originate from the former location of the disturbed area, although no outfall can be detected.

L1 and L2 continue to hold liquid. The lagoons may now be connected, as the wall between them (not annotated) appears to have partially eroded. L1 appears to have expanded on the west, and a retaining wall (not annotated) is visible on its southwest side. Two pipes are visible protruding from the retaining wall towards L1. Three possible pipes are again noted along the northwest side of L1. An area of probable wet soil (WS) is present west of L1, and a possible plume exists within L1 on its southwest side. This plume appears to originate from the westernmost pipe on the northwest side of L1. Several probable excavations (EX) are visible along the southeast side of L2 and contain liquid.

Possible refuse, also seen in 1978, remains southwest of B1.



FIGURE 7
HI MILL MANUFACTURING CO.

APRIL 18, 1980

APPROX. SCALE 1:3,000

JUNE 29, 1988 (FIGURE 8)

Significant findings were obtained from 1982, 1983, and 1984 non-reproducible source material. These findings will be annotated and/or discussed during this year of analysis.

A plume is no longer visible within Target Pond. Possible drums (D) were evident north and northwest of B3, within the fence, in 1982. Also, possible containers were seen in 1984 along the southeast side of B3.

L1, which is no longer present in 1988, was still in use as late as 1984. L1 was filled with liquid, and a light-toned scum (not annotated) was seen on the liquid from 1982 to 1984. A possible pipe (not annotated) on the northwest side of L1 was identified in 1982. Grading scars (not annotated) and material that was apparently being pushed into L1 were identified in 1984, indicating the possibility that this lagoon was in the process of being filled.

L2 was present and filled with liquid in 1982 and 1983. The 1983 source material revealed a possible breach between L1 and L2 at the west side of L2, which first appeared to be eroded in the 1980 photography. By 1984, L2 had been removed and the entire southeast corner of the site was graded. A shallow pit filled with liquid was visible in 1984 at the former location of L2.

In 1988, an area of wet soil is visible at the location of the former lagoons. A mound lies between the two areas of wet soil, partially over the former location of the lagoons. A ditch, present in 1982, extended from the mound to the area of wet soil to the north. A linear ground scar, in the location of the former pond, is now noted east of the wet soil. The probable excavations and a possible plume seen in 1980 were no longer present by 1982. However, a possible pipe (not annotated) was seen on the northwest side of L1 in 1982.

A possible pipeline was seen east of B1 in 1982. In 1983 a probable pipeline farther west was present. These pipelines appeared to extend from B1 towards the site boundary and were no longer visible in 1984.



FIGURE 8
MILL MANUFACTURING CO.

JUNE 29, 1988

APPROX. SCALE 1:2,900

Additional fencing was installed in the southwest portion of the site between 1983 and 1984 in order to enclose an addition to the site. A third lagoon, L3, appeared inside this addition in 1984 and contained liquid. Like L1, the liquid within L3 exhibited a light-toned scum. This lagoon was filled between 1984 and 1988, and a ground scar (not annotated) is seen on the 1988 photography in its former location. A large mound, possibly composed of the earthen material extracted during the creation of L3, is visible south of L3's former location. Probable channelized drainage leads southwest from L3's former location to a point outside the site boundary.

The area southwest of B1 has been paved. Approximately three probable containers, light-toned and cylindrical, are seen inside the fence south of B1, and a vertical tank (VT) is noted adjacent to B1. The possible refuse seen in 1980 is no longer present.

MARCH 20, 1991 (FIGURE 9)

Two separate groups of drums are present north of B3. One group contains approximately ten drums; the other, fourteen. A group of possible containers is seen north of the drums. A vertical tank is located outside the fence, north of B1. One horizontal tank (HT) is seen on the east side of B3.

Medium-toned (MT) material has been piled in two areas along the site's eastern boundary and at the southeast corner of B3. Light-toned material is present farther south and appears to be composed of many coarse-textured objects.

The mounded material, in the former locations of L1 and L2, and seen first in 1988, is clearly visible on the 1991 photography. The mound continues west towards B1. Channelized drainage is seen north of the mound, beginning at a pool of liquid and running east to Target Pond, where a ground scar was present in 1988. Whereas in 1988 the ground south of the mound appeared flat, it now appears to contain several smaller mounds (not annotated).

Pipes, possibly monitoring wells, have been placed in several locations around the mound. One is located just north of the pooled liquid connected to the drainage channel. A light-toned powdery material is seen next to the pool of liquid. A pipe and two probable pipes are south of the mound near two areas of wet soil. A fifth pipe is visible at the southwest corner of B3. All of these pipes protrude vertically from the ground.

An area of possible wet soil is seen south of B1, and light-toned possible refuse lies farther south of the wet soil.

The vertical tank alongside B1, first seen in 1988, is again visible. Light-toned powdery material is located adjacent to this tank. Three possible containers, seen in 1988, no longer exist onsite.

A dark-toned vegetated mound is visible where L3 had been in 1984 and a ground scar was seen in 1988. The large mound and probable channelized drainage, present in 1988, remain. An area of possible wet soil is seen where the probable channelized drainage begins.



FIGURE 9
MILL MANUFACTURING CO.

MARCH 20, 1991

APPROX. SCALE 1:1,600

REFERENCES

AERIAL PHOTOGRAPHY

<u>Date</u>	<u>Agency</u>	<u>Mission Code</u>	<u>Agency Frame #</u>	<u>Orig. Scale</u>	<u>EPIC Frame #</u>
June 5, 1957	ASCS ¹	XR	3P:100-102	1:20,000	22150:42-44
July 5, 1964	ASCS	XR	2EE:16-18	1:20,000	22150:45-47
April 4, 1967	USGS ²	VBPC	4:178,179	1:19,000	20612,20613
June 8, 1970	MIDSHT ³	MDSH	CZL:706,707	1:24,000	33180,33181
October 14, 1973	USGS	VDJA	3:199,200	1:24,000	20614,20615
May 10, 1975	MIDSHT	SEMOG	2:252,253	1:24,000	33184,33185
March 25, 1976	SCS ⁴	26125	176:121-123	1:38,000	33492-33494
August 17, 1978	MIDNR ⁵	51	3:93,94	1:24,000	33770,33771
April 18, 1980	MIDSHT	80-230	14:13,14	1:24,000	33182,33183
June 29, 1988	MIDNR	437	372:18,19	1:24,000	33451,33452
March 20, 1991	EPA ⁶	90/013	4-6	1:4,000	90/013:4-6

MAPS

<u>Source</u>	<u>Name</u>	<u>Scale</u>	<u>Date</u>
USGS	Highland, Mich.	1:24,000	1983
NWI	Highland, Mich.	1:24,000	Based on 1978 aerial photography

¹Agricultural Stabilization and Conservation Service, U.S. Department of Agriculture

²U.S. Geological Survey, U.S. Department of the Interior

³Michigan Department of State Highways and Transportation, Lansing, Michigan

⁴Soil Conservation Service, U.S. Department of Agriculture

⁵Michigan Department of Natural Resources, Lansing, Michigan

⁶U.S. Environmental Protection Agency

⁷National Wetlands Inventory, U.S. Fish and Wildlife Service, U.S. Department of the Interior

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U.S. Department of Agriculture, Soil Conservation Service. 1987. Hydric Soils of the United States.